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ABSTRACT

The audiology curriculum of the Department of Communicative Disorders at Utah State University which has been developed to prepare specialists in clinical and/or educational management of aurally handicapped children is described. Focused upon are prevalence of children's unilateral and bilateral hearing loss, areas affected by hearing impairment (such as speech and emotions), differentiation of hard of hearing from deaf and from normal hearing children, need for more data on individual needs, and need for developing extensive state, university, and school district delivery of services. Discussed are the audiology specialty model; competency areas needed by audiology specialists; the curriculum design, which includes a five year program leading to the Master's degree; formative and summative evaluation (such as an input-output training program, or a precision teaching approach to management) either planned for or utilized in the Department; and verbal and performance competencies. (MC)

ED 081141

EDUCATIONAL AUDIOLOGY HARD OF HEARING

FREDERICK S. BERG, Ph.D.
Utah State University

United States Office of Education
Bureau of Education for the Handicapped

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FINAL REPORT

Project No. 6
Grant No. OEG-0-71-3681-(603)

EDUCATIONAL AUDIOLOGY HARD OF HEARING

FREDERICK S. BERG

Utah State University

Logan, Utah

May, 1973

The research reported herein was performed pursuant to a grant with the Bureau of Education for the Handicapped, United States Office of Education, Department of Health, Education, and Welfare. Contractors undertaking such projects under government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent the official position of the Bureau of Education for the Handicapped.

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Previous to Project No. 6, 1969-72, a summer institute sponsored by the U.S. Office of Education, and entitled "Characteristics and Needs of the Hard of Hearing Child" was held on the campus of Utah State University. During the project two additional institutes were held, one entitled "Job Task in Educational Audiology" and the other "University Curriculum in Educational Audiology." The names of participants at these institutes, together with those of Project No. 6 consultants and key USU faculty members who have been contributors, are listed below.

Characteristics and Needs of the Hard of Hearing Child
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SUMMARY

In the United States a gap exists in providing special supportive services to facilitate the learning and adjustment of the hard of hearing child in the home, school, and community. During the last seven years staff members of the Department of Communicative Disorders at Utah State University have been developing a unique audiology curriculum designed to prepare specialists who can conceptualize the characteristics and needs of this neglected youngster and who can serve as clinical and/or educational managers for this population.

In this report focus is given to the prevalence of unilateral and bilateral hearing loss among children, the areas affected by impairment of hearing, the differentiation of the hard of hearing child from the deaf youngster and from the normal hearing child, the variables responsible for the current lack of utilization of residual hearing, the need for obtaining data on individual children, and the need for extensive related development and/or revamping at the state office, university, and school district levels of delivery of services.

A rationale is given for the development of an audiologist whose professional expertise encompasses the competencies of (1) audiometry; (2) coordination with otology; (3) hearing aid evaluation and management; (4) communication evaluation, design, and training; (5) environment evaluation, design, and adjustments; and (6) education evaluation, design, and training. The current certification requirements of both the American Speech and Hearing Association and the Council on Education of the Deaf are compared with the more comprehensive USU audiology curriculum. The longitudinal design of the audiology specialization at USU is shown as a five-year curriculum leading to the Master's degree. Formative and summative evaluation which has been considered, designed, and/or utilized at USU is also described. The emphasis of the USU Department of Communicative Disorders on the attainment of verbal and performance competencies is also explained. The report also provides numerous references of value for the mounting of national, state, and local change in the clinical and educational management of the hard of hearing child.

INTRODUCTION

In the United States, hard of hearing children typically are not being educationally managed so as to compete satisfactorily in society. In the relatively few school systems where services for these youngsters are established, the critical resources that do exist generally are not being utilized effectively. In the great majority of school systems, supportive services for the hearing impaired are minimal or nonexistent, and administrative personnel often seem to be unaware of the need for special programming and adjustments for these children. In many instances also, the hard of hearing child does not want to be singled out, and the hidden nature of his handicap permits him to appear normal. It is understandable why many hard of hearing children, once their problems are identified, are referred to schools for the deaf; but in these facilities, their special unique needs are characteristically neglected also (A Study of Current Practices in Education for Hard of Hearing Children, 1969).

Few states have recognized the complex problems hearing impaired children face (National Research Conference on Day Programs for Hearing Impaired Children, 1968), and even fewer the characteristics and needs of the hard of hearing as apart from those of the deaf. The Joint Committee on Audiology and Education of the Deaf, of the American Speech and Hearing Association, and the Conference of Executives of American Schools for the Deaf recently advanced the following recommendations with regard to the hard of hearing:

1. A general education campaign should be mounted to explain the varied problems of this population.
2. State departments of education and health should develop and exert greater leadership to promote supportive services for these neglected children.
3. Research should be conducted to develop models of delivery systems and to assess and improve the state of the art related to the needs of hard of hearing children (A Study of Current Practices in Education for Hard of Hearing Children, 1969).

Lacking a conceptualization of the profile of this population, expertise to launch a program into this area, and financial support, the universities have also lagged in the development and refinement of professional curricula unique to the clinical and educational management of the hard of hearing child. Consequently, the specialists who select or are expected to help the hard of hearing child generally do not have the advantage of a professional background designed to meet the requirements of the job task.

In growing recognition of the lack of programming for the hard of hearing child, a group of concerned faculty members of the Department of Communicative Disorders at Utah State University (USU) has taken initiative in focusing national attention on the characteristics and needs of hard of hearing children by:

1. Developing a model university curriculum specifically designed to prepare specialists to serve the aural rehabilitative needs of hard of hearing children and youth.
2. Contributing research designed to describe the profile of the hard of hearing child, to improve the state of the art, and to identify and clarify models of delivery of services.
3. Establishing a model supportive program for hard of hearing children enrolled in the local school systems.
4. Developing a model post-secondary facilitative program for hard of hearing college students.

5. Disseminating and exchanging relevant information by use of institutes, publications, exhibits, speeches, and other communications.

The present report summarizes the profile of the hard of hearing child, the model curriculum, and constitutes a final report of OE-BEH Special Project No. 6 entitled "Educational Audiology, Hard of Hearing," and conducted during 1969-72.

PROFILE AND PROBLEMS OF THE POPULATION

In this section of the report the prevalence, the definition, and the unique characteristics of the hard of hearing child will be described to provide an underpinning and rationale for the particular model of curriculum developed at USU. Specific consideration will be given to incidence by degree, bilateral versus unilateral loss, comparison with normal hearing and deaf populations, school settings, hearing aid and noise problems, population and individual profiles, and a multiparametric model of areas affected by hearing loss and needing compensatory adjustments.

Basic Considerations

The prevalence of hard of hearing and deaf children and youth in the United States may be derived from data of a recent national survey (Willeford, 1971) and from the summary of selected characteristics of hearing impaired students, United States, 1969-70, a demographic study from Gallaudet College (1971). In the former study, careful audiometric testing in specially constructed mobile units was conducted in the regular schools of this country. Table 1 presents pertinent data on the 38,568 sample of males and females, grades 1-12. It may be noted that 170+/1000 have unilateral (one ear) hearing loss and 41/1000 bilateral (two ears) impairment.

Table 1. Number of school-age hard of hearing children per 1,000 youngsters with varying unilateral and bilateral hearing impairment in the United States.

dB Loss	Unilateral	Bilateral	
11-25 (slight)	154+	34	
26-45 (mild)	13+	5	=7/1000
46-100 (moderate-severe-profound)	3+	2	

In all, 211+/1000 or about one in every five children have a hearing loss in one or both ears that is at least medically significant. Seven per thousand children have bilateral auditory insensitivity of mild to profound loss, and constitute the population who usually have been referred to as those having educationally or socially significant losses. However, a recent study in Elgin, Illinois by Quigley and Thomure (1968) reveals that verbal and educational retardation exists among elementary and secondary school shildren with even slight bilateral auditory insensitivity. See Table 2.

Table 2. Difference between expected performance and actual performance of hard of hearing children on various subtests of the Stanford Achievement Test.

Hearing threshold level (better ear)	Number	IQ	Word meaning	Paragraph meaning	Language	Subtest average
Less than 15 dB	59	105.14	-1.04	-0.47	-0.78	-0.73
15 – 26 dB	37	100.81	-1.40	-0.86	-1.16	-1.11
27 – 40 dB	6	103.50	-3.40	-1.78	-1.95	-2.31
41 – 55 dB	9	97.89	-3.84	-2.54	-2.93	-3.08
56 – 70 dB	5	92.40	-2.78	-2.20	-3.52	-2.78
Total Group	116	102.56	-1.66	-0.90	-1.30	-1.25

Also a study by Giolas and Wark (1967) has shown that even children with unilateral hearing loss misunderstand speech more often than normally with consequent embarrassment, annoyance, inadequacy, and helplessness. In the final analysis, each child with any degree of hearing loss might well be individually evaluated for auditory, communication, and educational deficit or skill to determine the impact of hearing loss upon performance, where such can be separated out.

The Gallaudet demographic study indicates that an additional 41,000 hearing impaired children are enrolled in the special schools and classes for the deaf and hard of hearing throughout the United States. A breakdown by degree of loss in the better of two impaired ears and by percentage of children is provided in Table 3.

Table 3. Percentages of children with varying degrees of hearing loss among 41,000 pupils enrolled in the schools and classes for the hearing impaired, United States, 1969-70.

dB Loss	Under 25	25-39	40-54	55-64	65-74	75-84	85+
Percentage	3.5	5.3	7.4	7.8	11.0	13.4	51.5

It may be noted that 48.5 percent of these hearing impaired children have loss of less than 85 dB. Looked at dimensionally, almost half of the youngsters in special programs for the hearing impaired have slight, mild, moderate, and severe losses; and the other half, more severe, profound, and total acoustic deficit. Davis (1970) of the Central Institute for the Deaf suggests that 92 dB is an appropriate statistical referent for a hypothetical dividing point between being hard of hearing or deaf. Suggestions by Bitter and Mears (1972) that 56 dB, and by Vernon (1972) that even 45 dB, be that referent are entirely out of line with audiological findings and auditory training data obtained during the past 20 years. As a consequence of longitudinal studies of auditory training with many preschool children with severe and profound hearing losses, Wedenberg (1967) concludes that as high as 80 percent of children in schools for the deaf in Sweden could have been educated as hard of hearing children.

Another criterion for differentiating the hard of hearing child from the deaf youngster is the manner in which each learns language (DiCarlo, 1968).[1] The hard of hearing child learns language in the usual way, i.e. through the auditory processes, and in time approximates normality in linguistic and academic competence provided guidance, differential educational attention, stimulation, and tutoring are utilized from the very early years of life. The deaf child, in contrast, acquires language by use of nonauditory processes, and may characteristically fall short of linguistic and academic normality, with the same amount of time and effort exerted.

Typically, the hard of hearing child is linguistically and academically behind but not to the extent that the deaf youngster is (Berg, 1970). Under present educational programming in the United States, 60 percent of all students 16 years of age or older in schools for the deaf have been found to read at grade level 5.3 or below (Boatner, 1965; McClure, 1966). Only 5 percent read at tenth grade level or better, and most of these hearing impaired students either have had normal hearing during spoken language development, or are hard of hearing. The definition of the hard of hearing child may be clarified by comparison of the oral communication and the language competencies of this youngster with those of the normal hearing child and the deaf youngster.

The normal hearing child is a youngster who often can hear the entirety of speech notwithstanding its faintness or distance (within limits). Figure 1 below reveals this complete perception as a banana-shaped speech signal being completely "packaged" into the large auditory or gray area which comprises the physical dimensions of normal hearing. Since the normal hearing child often hears the entirety of what others say and what he himself says, he develops at an early age a refined skill in producing speech as well as basic mastery of the language.

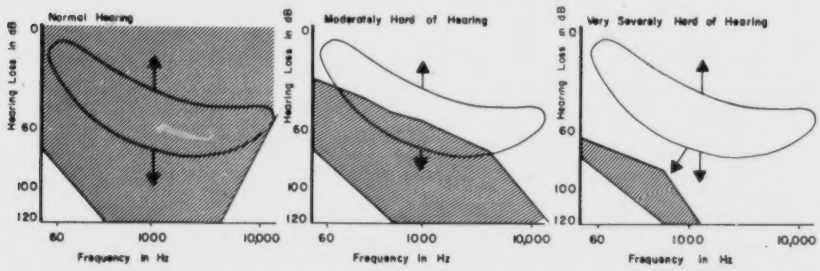


Figure 1. Conversational speech signal (modified from Fant, 1959) and auditory areas of a normal hearing child and two hard of hearing children with bilateral impairment, one with a moderate loss and the other with very severe loss.

[1]DiCarlo's statement was based in part upon his own study of 15 hard of hearing teenagers and young adults. By 15 years, 2 months to 19 years, 5 months, all of these children had achieved linguistic competence that was normal for their age levels. However, their speech was typically defective. In a report of this investigation DiCarlo presented three audiograms: a composite of the group, an abrupt high tone loss averaging 80 dB in the better ear, and a gradual high tone loss averaging 87 dB in the better ear.

The hard of hearing child is a hearing impaired individual who hears varying significant amounts of the distinguishing features of speech. What he hears and perceives at a given moment depends upon a combination of one or more of: hearing insensitivity, faintness of sound, distance between speaker and listener, noise background, language deficiency, past experience, environmental unawareness, and corresponding lack of compensatory adjustments. Because the hard of hearing child often hears imperfectly or inconsistently, he characteristically speaks defectively, misunderstands others, and learns vocabulary and sentence structure more slowly or to less of an extent than does the normal hearing child. Figure 1 illustrates the auditory areas of two hard of hearing children with bilateral impairment, one with a moderate loss and the other with very severe loss. Prior to the availability of newer design and delivery concepts in hearing aids and techniques for evaluation, both of these children may have been classified as deaf, particularly the youngster with the very severe loss (Fellendorf, 1966). Now, the child with the moderate and severe loss, and even in many instances the youngster with very severe loss, function to varying extents as hard of hearing children (McConnel, 1968).

The deaf child typically is a hearing impaired person with profound or total loss of auditory sensitivity and very little or no auditory area. Under the most ideal listening and hearing aid conditions, he either does not hear the speech signal or perceives so little of it that audition cannot se .e as the primary sensory modality for the acquisition of spoken language or for the monitoring of speech. Figure 2 shows three auditory areas of children who might be classified audiometrically as being deaf.

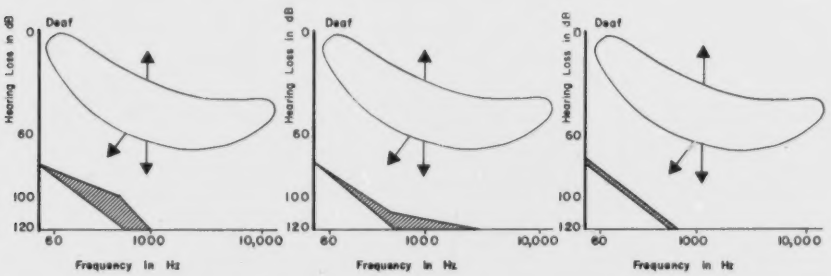


Figure 2. Conversational speech signal (modified from Fant. 1959) and auditory areas of three children who might be classified as being audiometrically deaf.

One area shows no response to amplified auditory stimuli at the extent of the audiometer. The other two auditory areas are those of children with very severe losses, the one relatively flat across the frequency range, and the other with no response at the mid and high speech frequencies (Wedenberg, 1954). The latter two auditory areas are even more restricted than that of the very severely hard of hearing child shown in Figure 1.

Two procedures of value for indicating whether or not a child with very severely impaired hearing can function as a hard of hearing child might well be described. One is to experimentally fit the child with a hearing aid, monitor adjustment and use, and carefully stimulate this youngster with meaningful language learning situations over a period of three months. An accompanying initiation or increase in vocalization or verbalization under such a condition usually indicates the presence of functional residual hearing.

The second procedure becomes appropriate once the hearing impaired child is about three years of age or can articulate several of the sounds of speech or some short words. The specialist then requires that the child repeat back these sounds or word without looking but while wearing the hearing aid. The child who can consistently echo even some of these items can usually learn language and speech through hearing. The items should be chosen to be representative of the population of phonemes. Berg (1972b) described such an experiment with a 22-year-old deaf man who is functionally deaf but potentially hard of hearing.

Further Considerations

In contrast to the statement by Vernon (1972) that amplification (auralism) will help only some children in schools for the hearing impaired to hear speech, careful investigation is much more likely to reveal that most of these youngsters have enough hearing to develop language primarily through this modality. Currently, however, five interrelated variables seem to be primarily responsible for the lack of utilization of residual hearing:

1. Educators of the hearing impaired are not aware generally of the extent to which this residual hearing actually exists.
2. They also do not realize how this auditory area, where it does exist, can be exploited functionally.
3. High noise and reverberation levels generally existing in both the regular and special classrooms or educational facilities mask out the amplified speech signal.
4. Auditory training equipment designed to bypass classroom noise is characteristically not being used appropriately or is in a state of disrepair.
5. "Total Communication," a currently popular audio-visual approach to the education of the hearing impaired child, is practiced generally as a visual only method. In theory, it is the combined use of speech, hearing aids, fingerspelling and signs for the development of language and for interpersonal communication; but in practice speech and especially hearing typically are being negated. One case in point is a statement from the principal of a school for the hearing impaired that recently adopted total communication. He states that there is only one hard of hearing child in that school, although the audiometric profile of the children enrolled there is highly similar to that of the Gallaudet demographic data shown in Table 3.

The children who cannot perceive amplified speech at all or those who perceive it insignificantly should be called "deaf." We should now begin calling all other hearing impaired youngsters "hard of hearing," notwithstanding whether they happen to be enrolled in a school for the deaf or in a regular classroom. All too often our use of the term "deaf" has led to dichotomous or polarized thinking, with unfortunate consequences in areas of diagnosis, planning, placement, and expectations (Ross and Calvert, 1967). In other words, this polarization of thought which we have mistakenly fostered has acted as a self-fulfilling prophecy. Through tradition, confused thinking, and bias we have called a child deaf who is hard of hearing, have often treated him as if he were deaf, have frequently expected him to function as a deaf child, and have looked the other way at his lack of achievement and adjustment (Fellendorf, 1966).

The suggested use of the terms "deaf" and "hard of hearing" should not be confused with the methodological issue of whether a particular hearing impaired child should be educated orally, or by use of total communication, or by use of some other method. Certainly, however, the less hearing the child has, the more dependent he will be on use of visual communication clues; whether oral, hand formations from "cued speech" (Cornett, 1967), hand or arm positions in fingerspelling and sign language, or a combination of these.

Data is now needed to provide a basis for appropriate decision making with regard to the communication needs of specific hearing impaired children. Comparative unimethod and multimethod studies should be conducted on a longitudinal basis. Total communication as designed to be used may emerge to have some surprising benefits, particularly as used differentially at various stages of learning and interpersonal adjustment. Data may also clarify the observations of Wedenberg (1954) that progress with the auditory approach is slow initially but accelerates thereafter. It may also extend the observations of Gaeth (1971), based upon his extensive studies, that vision with all hearing impaired children is initially the meaningful modality, and that the development of a "listening attitude" (Wedenberg, 1954) requires systematic conditioning. The outstanding educational success stories of selected children and of entire schools may be shown to result from a combination of good teaching and methodology (Ling, 1972). Nevertheless, hearing cannot help but emerge as the dominant sense that is uniquely designed for language development and speech acquisition in its most refined state.

The evaluation of the utilization of residual hearing in comparison with other sensory avenues and communicative inputs among hearing impaired children during the early formative or language learning years is particularly relevant. A Statewide Infant Hearing Impaired Program, termed SKI-HI and supported by the United States Office of Education and by Utah agencies, should provide considerable data toward this end. Conducted during 1972-75, it is designed to identify hearing impaired infants (birth to five years) throughout the state of Utah, provide audiological treatment and services, and then provide home visit support to develop an infant-home program which will facilitate language development (Clark, 1973).

Beyond the infant-home level the need exists to develop special supportive services for some 500,000 hard of hearing children, youth, and young adults in preschool, elementary, secondary, and post-secondary educational programs throughout the country. These are the 10/1000 or 1/100 children with mild, moderate, and severe bilateral losses and those with moderate-severe unilateral impairment. A sample of this population was described briefly by one director of special education in an Illinois locality. He searched the school files and located 121 children with bilateral auditory insensitivity in excess of 40 dB. The teachers of these children rated their performance on a questionnaire. Only 11 of the 121 were rated as normally participating class members. Of the 110 others, 28 had failed one or more grades, 43 were underachievers, 28 were socially introverted, and 17 were considered social problems (Bothwell, 1967).

At USU we are experimenting with the use of an aural approach in a college facilitative program for the hearing impaired. The approach is based upon the assumption that sounds reaching the ear through a properly fitted hearing aid, together with lip movements and the communicative efforts of college instructors, contribute sufficiently to the pool of information to enable the hard of hearing individual to comprehend ideas, activities, and concepts involved in routine university class requirements. Our success with more than 60 young hard of hearing and deaf adults who have participated in this supportive program ordinarily has been related to utilization of residual hearing (Berg, 1972).

A booklet entitled "Breakthrough For the Hard of Hearing Child" clarifies this population further by describing the nature of sound, the process of hearing, the profile of the hearing impaired child, and the modern developments in medical and surgical assistance, in hearing aids, and in aural rehabilitation. Of particular value are the summaries of heretofore largely unrelated and unavailable materials that provide a basis for further study (Berg, 1971b).

The value of obtaining an individual profile on each hearing impaired child is evident by study of many variables that interact to determine progress and adjustment. A multiparametric model presented in Figure 3 below identifies the existence of at least three levels of concern and thirteen factors effected by or affecting the child.

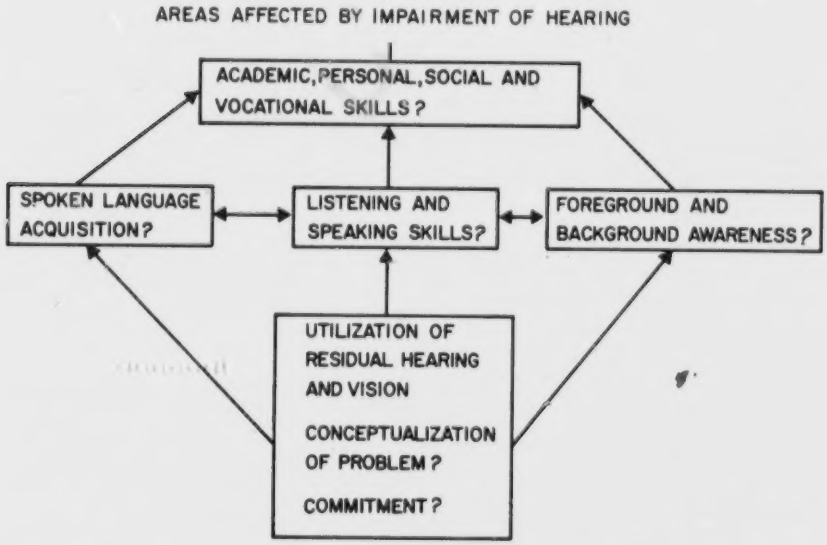

AREAS AFFECTED BY IMPAIRMENT OF HEARING
ACADEMIC, PERSONAL, SOCIAL AND VOCATIONAL SKILLS?
SPOKEN LANGUAGE ACQUISITION?
LISTENING AND SPEAKING SKILLS?
FOREGROUND AND BACKGROUND AWARENESS?
UTILIZATION OF RESIDUAL HEARING AND VISION
CONCEPTUALIZATION OF PROBLEM?
COMMITMENT?

Figure 3. Areas affected by impairment of hearing.

The basic underlying factors include utilization of residual hearing and/or vision, conceptualization of the problem, and commitment to alleviate it. The communication or second-level variables are spoken language acquisition, "listening" and speaking skills, and foreground and background awareness. The end product or third level of the model encompasses the academic or experience, personal, social, and vocational performance of the hard of hearing individual. The arrows between levels and among factors of Figure 3 indicate many of the interactions and primary directions of effects. Table 4 clarifies this multiparametric model in a comparison of hard of hearing, normal hearing, and deaf populations of children and youth.

Table 4. Hypothetically typical values or expected degrees of achievement or adjustment associated with being normally hearing, hard of hearing, or deaf at each of three levels of interaction and within 13 categories and selected subcategories of a multiparametric model (Figure 3).[a]

Level	Component	Normally hearing	Hard of hearing	Deaf
Basic	A1. Audition			
	a. Bilateral sensitivity	0-10 dB	40-92 dB	92+ dB
	b. Recognition (cochlear integrity)	Full	Partial	Absent
	c. Discomfort	110 dB	Variable	Absent
	d. Localization	Multidirectional	Undirectional or somewhat multi-directional	Absent
	2. Vision	Sensitive, perceptive, binocular, but undirectional for all three populations		
	3-4 Conceptualization and commitment related to expectations (too low, realistic, too high) and achievements for all three populations			
Communication				
	B1. Spoken language acquisition	Achieved rapidly and completely	Achieved more slowly or incompletely	Achieved very slowly or incompletely
	2. Speech acquisition	Achieved rapidly and completely	Achieved more slowly or defectively but intelligible	Achieved very slowly or unintelligible
	3. "Listening" or speech understanding (See A1, 2)	Nearly all situations	Many situations (See A1, 2, B1)	Few situations
	4. Environmental awareness (See A1, 2) (With B3 determines (B1)	Can attend to great numbers of auditory and visual stimuli of foreground and background (See A1, d)	Can attend to selected auditory and visual stimuli of foreground, and visual stimuli of background (See A1, d)	Can attend to selected visual stimuli of foreground and background (See A1, d)
End Product				
	C1. Academic (by age 18 years)	12th grade	9th grade	6th grade
	2. Personal (self-confidence)	Most	Less	Least
	3. Social (interaction with hearing)	Most	Less	Least
	4. Vocational (options)	Many	Fewer	Fewest

[a]This table encompasses some 200,000 children with 40-92 bilateral hearing loss who are enrolled in the regular schools and regular classes and in the special schools and special classes where normally hearing and deaf youngsters exist respectively. Hard of hearing children with varying degrees of unilateral auditory insensitivity and those with slight (11-25 dB) and somewhat mild (26-39 dB) bilateral impairment are not considered in this table.

In resume, the hard of hearing child is typically a youngster with deep and pervasive troubles. An unfortunate sequel to this major problem is the general lack of conceptualization as to the characteristics and needs of this population. Hopefully, the heretofore isolated data that is being pooled currently from various contributive sources will lead to a revamping in thinking and programming for this child.

UNIVERSITY CURRICULUM

The introduction and prior section of this report identified and clarified an array of overlooked and unsolved problems characterizing the hard of hearing child and his environment. In this the final section of the report, rationale for and description of a unique university curriculum will be presented.

Professional Gap

An examination of the curricula of colleges and universities throughout the United States reveals that the institutions of higher learning have not been preparing specialists to work specifically with the population of hard of hearing children. More than 200 colleges and universities offer one or more specializations in audiology, speech pathology, and education of the hearing impaired. However, perhaps only one of these universities, i.e. Utah State University (Sanders, 1971), has a curriculum that encompasses the competencies needed in the clinical and educational management of the hard of hearing child.

The net effect of not having a professional specialty to serve the hard of hearing child has several ramifications as follows:

1. The great majority of hard of hearing children remain largely unserved (A Study of Current Practices in Education for Hard of Hearing Children, 1969).
2. The relatively few audiologists, speech pathologists, and teachers of the hearing impaired who actually serve the hard of hearing in the schools require inservice training or independent graduate study that is difficult for them to obtain (Sommers, 1968; Yater, 1973).
3. The supportive services that are provided the hard of hearing child tend to be inadequate and the benefits derived unimpressive (A Study of Current Practices in Education for Hard of Hearing Children, 1969). The state of the art has been undeveloped and the models of delivery of services generally incomplete or fragmented.

As specialists at USU have moved toward the development of a model curriculum, it has become evident that the professional preparation of this specialist should encompass behavioral competencies in evaluation, design, and training across all areas of concern. The conventional model of the audiologist who tests and of the teacher of the hearing impaired who teaches communication and academic skills becomes outmoded for at least five reasons as follows:

1. Current audiologists and teachers of the hearing impaired seldom assist each other because they do not understand the relevance of the separate competencies each can bring to the management task.
2. The evaluative workups of the audiologist generally are limited to audiometric tests and hearing aid evaluations.
3. The teacher of the hearing impaired often designs educational programming based upon insufficient evaluative data.
4. The teacher of the hearing impaired characteristically has been prepared to manage a special classroom of deaf children rather than function as a resource teacher for hard of hearing youngsters enrolled in a regular classroom.
5. Many school district administrators have been unwilling to hire "two" specialists to serve "one" child, e.g. a speech (and hearing) clinician and an audiologist, or an audiologist and a teacher of the hearing impaired.

USU Model

The USU model is a fresh approach into a professional area that heretofore has neglected the hard of hearing child. Among its characteristics are the following:

1. It encompasses the total characteristics and needs of the hard of hearing child (Berg and Fletcher, 1967).

2. It seeks to isolate the parameters of hearing impairment, to identify the deficiencies rising from hearing disability, to relate these to the unique characteristics of individuals, and to develop educational programs designed for hard of hearing children.

3. It acknowledges that a coordination of skills of varied professionals and adjustments of various laymen are needed to help the child to the utmost, although the model gives greater management responsibility to one specialist than has heretofore been the case.

4. It recognizes that the newer developments in education–increasing reliance on behavioral engineering, sensory aids, and instructional technology–have critical relevance to the educational management of the hard of hearing person.

5. It is designed to prepare specialists to meet the certification and coming licensing requirements in both audiology and education of the hearing impaired with focus upon the hard of hearing child and upon the regular school settings.

6. The model is called an audiology specialty, but it must be differentiated from the great majority of programs in audiology that currently are limited in the clinical and educational management of the hard of hearing child. As audiology has emerged during World War II as the offspring of two parents–speech pathology and otology–it has been concerned with the science of hearing and the evaluation and habilitation of individuals with hearing disorders (Newby, 1958). During a 20-25 year period thereafter, it evolved primarily into a field of study concerned with the measurement of hearing and the evaluation of the hearing aid, with focus upon research and upon clinical endeavors largely unrelated to the educational management of the hard of hearing child. However, a movement back toward an initial interest of the audiological profession in habilitation and education can be interpreted by the recently revised requirements of the American Speech and Hearing Association for the Certificate of Clinical Competence in Audiology (Requirements for the certificate of clinical competence, 1973). The specific course requirements include a minimum of 60 semester (90 quarter) hours of credit with the following breakdown: normal development and use of speech, language, and hearing, 12; pathologies, assessment, amplification instrumentation, speech and language (may include manual communications) *habilitation* and/or rehabilitation, environmental noise control, identification audiometry, electronics, calibration related to the hearing impaired, 24; speech and language evaluation and management procedures not associated with hearing impairment, 6; theories of learning and behavior, *related professional services and information* of individuals with communicative disorders, *18.*

7. The model must be differentiated from almost all programs designed to prepare professionally the educator of the deaf or hearing impaired. The lack of audiological emphasis given in such deaf education programs is evidenced by the suggested guides for provisional and for professional certification, as developed by the Committee on Professional Preparation and Certification adopted by the Council on Education of the Deaf. The provisional certification suggests a 30 semester (45 quarter) hour block that de-emphasizes audiology: foundations, 3; speech science and *audiology*, 3; language and communication, 9; curriculum and instruction, 9; student teaching, 6 credits. A 20 semester (30 quarter) hour allocation of credits for advanced study toward professional certification also is characterized by a lack of audiology: language, communication, curriculum, instructional technology, supervision, administration, 20; and foundations, psychology, sociology, *audiology,* acoustics, anatomy, 10 (Standards for the Certification of Teachers of the Hearing Impaired, 1972).

USU Competencies

The verbal and/or performance competencies needed by the audiologist in the management of the hard of hearing child encompass the behaviors included in Figure 4.

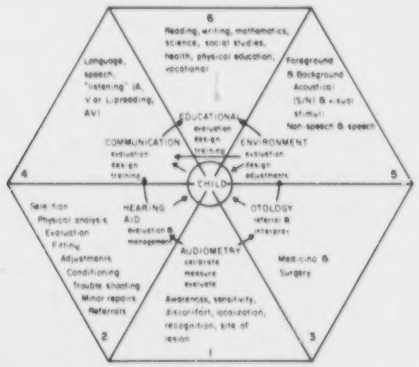

6
Reading, writing, mathematics, science, social studies, health, physical education, vocational
Language, speech, "listening" (A, V or Lipreading, AV)
Foreground & Background Acoustical (S/N) & visual stimuli: Non-speech & speech
EDUCATIONAL evaluation design training
COMMUNICATION evaluation design training
ENVIRONMENT evaluation design adjustments
4
5
CHILD
Selection Physical analysis Evaluation Fitting Adjustments Conditioning Trouble shooting Minor repairs Referrals
HEARING AID evaluation & management
OTOLOGY referral & interpret
AUDIOMETRY calibrate measure evaluate
Medicine & Surgery
Awareness, sensitivity, discomfort, localization, recognition, site of lesion
2
3
1

Figure 4. Verbal and/or performance competencies needed in the clinical and educational management of the hard of hearing child.

As noted in Figure 4, the job task of the audiologist who has major responsibility in and who coordinates the clinical and educational management of the hard of hearing child may be described under six categories:

1. Audiometry–measurement, evaluation, and recommendations related to auditory awareness, sensitivity, discomfort, localization, recognition, site of lesion.
2. Otology–referral to medical ear specialist for possible medical and/or surgical alleviation of hearing loss and ear pathology; interpretation of medical and surgical reports related to problems of the ear.
3. Hearing aid evaluation and management–selection, physical analysis, personal evaluation, fitting, adjustments, conditioning, trouble shooting, minor repairs, and referrals.
4. Communication evaluation, design, and training–spoken language, speech, and "listening" (auditory only, visual only or lipreading, and auditory-visual combined) development and/or remediation.
5. Environment evaluation, design, and adjustments–home, school, and community considerations related to nonspeech and speech, foreground and background stimuli, primarily acoustical and visual; signal/noise identification and modification.
6. Education evaluation, design, and training in written language and basic substantive areas–development and/or remediation; reading, writing, mathematics, science, social studies.

The interactions of these six areas of management is evident in part by the arrows of Figure 4. For example, it may be noted that (1) audiometry contributes to otology and hearing aid evaluation; (2) otological treatment and the hearing aid facilitates environmental input, communication, and education; and (3) communication training and environmental adjustment contribute to educational achievement. Whereas the audiologist has worked particularly within areas of audiometry, the hearing aid, and interaction with the otologist, he must also encompass areas of communication, the environment, and even education to complete the scope of the job task.

As the clinical and educational manager of the hard of hearing child, the audiologist specializes in evaluation, program design, and remediation. His may be a shifting role in which he serves as a school audiologist on one assignment, a hearing clinician on another, and a resource room or segregated classroom teacher on still another assignment. Or he may serve as the infant-preschool language facilitator for the hearing impaired, the rehabilitative audiologist in a hearing clinic, or in time the director of a multifaceted school program for hearing impaired children and youth.

Curricular design

The longitudinal design of the audiology curriculum at USU is shown within a five-year university curriculum leading to the Master's degree. As noted in Figure 5, the curriculum includes (1) general education preparation, (2) learning and communication underpinning, (3) observation and analysis of behavior, (4) management background, and (5) management applications. The plan calls for a continuing upgrading of verbal and performance competencies within courses, apprenticeship, internship, and externship experiences. Of particular interest is the entrance of the student into the management background during the spring quarter of the junior year and management applications one quarter later. In most audiology programs of other universities, in contrast, the management aspects of the curriculum begin during graduate work.

The *general education* preparation is indicated as a freshman-sophomore component to the curriculum. It encompasses course work in communication skills, mathematics, sciences, and humanities. With Advanced Placement (AP) and the College Level Examination Program (CLEP), many students entering the communicative disorders specialization of audiology have up to one academic year of waived credit. Thus, they are prepared to begin the underpinning or scientific background phase of the specialization during their first year at the university.

Figure 5 shows the topics of the *scientific background* to the USU audiology curriculum. The course registrations are designed to occur during the sophomore-junior years, assuming the student has not bypassed the general education preparation of the freshman year by waiver through AP or CLEP examinations, but extend even through the senior year. The course titles are: phonetics; language, hearing and speech development; introduction to communication science; anatomy of speech and hearing; clinical processes of behavior; analysis of behavior; human growth and development; introduction to language; language structures; psychoacoustic instrumentation; structure, function, dysfunction of the hearing mechanism; statistics; and introduction to research.

The *apprenticeship* component of the audiology specialty typically occurs during the junior year of the study program. Utilizing scientific competencies drawn from underpinning course work, the student observes, records, and analyzes the behavior of clients in a variety of clinical and educational settings.

Management background as a component of the specialty consists of course work in audiology and professional education. Beginning with the last quarter of the junior year, verbal and performance competencies in the specific areas shown in Figure 5 are acquired through lecture, discussion, demonstration, and various assignments. The course titles are: basic audiometry; speech audiometry; psychoacoustic instrumentation; structure, function, and dysfunction of the hearing mechanism; hearing aids; pediatric audiology; differential diagnosis of auditory disorders; disorders of articulation; hearing and speech management; advanced hearing and speech management; education of the hearing impaired; language disorders and hearing impairment; teaching language to the hearing impaired; the young hearing impaired child; education of exceptional children;

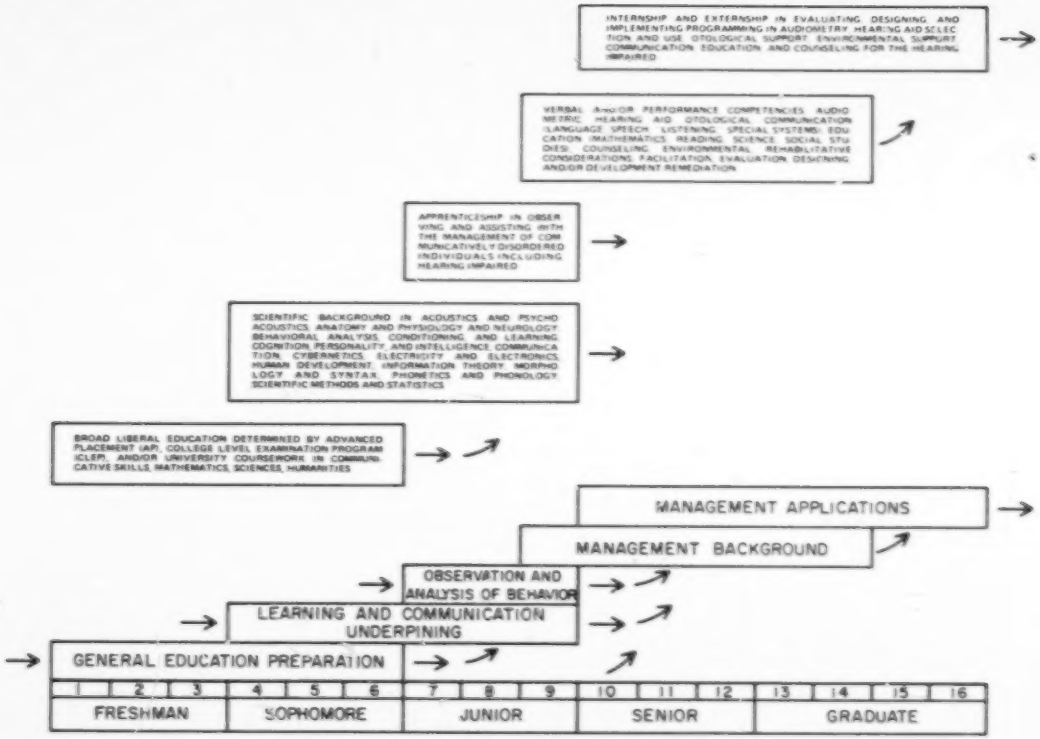

INTERNSHIP AND EXTERNSHIP IN EVALUATING, DESIGNING, AND IMPLEMENTING PROGRAMMING IN AUDIOMETRY, HEARING AID SELECTION AND USE, OTOLOGICAL SUPPORT, ENVIRONMENTAL SUPPORT, COMMUNICATION EDUCATION, AND COUNSELING FOR THE HEARING IMPAIRED
VERBAL AND/OR PERFORMANCE COMPETENCIES: AUDIOMETRIC, HEARING AID, OTOLOGICAL, COMMUNICATION (LANGUAGE, SPEECH, LISTENING, SPECIAL SYSTEMS), EDUCATION (MATHEMATICS, READING, SCIENCE, SOCIAL STUDIES), COUNSELING, ENVIRONMENTAL, REHABILITATIVE CONSIDERATIONS, FACILITATION, EVALUATION, DESIGNING, AND/OR DEVELOPMENT, REMEDIATION
APPRENTICESHIP IN OBSERVING AND ASSISTING WITH THE MANAGEMENT OF COMMUNICATIVELY DISORDERED INDIVIDUALS INCLUDING HEARING IMPAIRED
SCIENTIFIC BACKGROUND IN ACOUSTICS AND PSYCHOACOUSTICS, ANATOMY AND PHYSIOLOGY AND NEUROLOGY, BEHAVIORAL ANALYSIS, CONDITIONING, AND LEARNING, COGNITION, PERSONALITY, AND INTELLIGENCE, COMMUNICATION, CYBERNETICS, ELECTRICITY AND ELECTRONICS, HUMAN DEVELOPMENT, INFORMATION THEORY, MORPHOLOGY AND SYNTAX, PHONETICS AND PHONOLOGY, SCIENTIFIC METHODS AND STATISTICS
BROAD LIBERAL EDUCATION DETERMINED BY ADVANCED PLACEMENT (AP), COLLEGE LEVEL EXAMINATION PROGRAM (CLEP), AND/OR UNIVERSITY COURSEWORK IN COMMUNICATIVE SKILLS, MATHEMATICS, SCIENCES, HUMANITIES
MANAGEMENT APPLICATIONS
MANAGEMENT BACKGROUND
OBSERVATION AND ANALYSIS OF BEHAVIOR
LEARNING AND COMMUNICATION UNDERPINING
GENERAL EDUCATION PREPARATION
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
FRESHMAN
SOPHOMORE
JUNIOR
SENIOR
GRADUATE

Figure 5. Longitudinal design of the USU audiology curriculum.

foundation studies in education; teaching reading; teaching mathematics; teaching social studies; teaching science; teaching reading to the hearing impaired; school curriculum for the hearing impaired; seminars in audiology; medical backgrounds in communicative disorders; counseling parents of exceptional children; psychometrics; and thesis.

The *management application* component consists of a series of internships and externships occurring during a seven-quarter senior-graduate year sequence. As shown in Figure 5, this practicum encompasses evaluating, designing, and implementing programming in the six areas of management shown in Figure 4. The practicum locations include homes, clinical centers, regular classrooms, and special classrooms. The ages of clients vary from infancy to late adulthood, with particular focus upon the elementary level. The clients usually have hearing impairment, and approximately 500 clinical clock hours of experience are accumulated. Close supervision and monitoring are provided each audiology student as he rotates through internship and externship experiences so that his level of competency is continually increasing.

Curricular Evaluation

As the USU curriculum in audiology has emerged, formative and summative evaluation has been considered, designed, and/or utilized. Figure 6 shows an overall evaluation model that has been followed in the audiology and the speech pathology curriculums of the Department of Communicative Disorders. It encompasses input variables affecting students and the training program, output variables affecting both employers and clients, and the feedback loop from output to input designed to monitor product and input factors accordingly (Jensen, 1972).

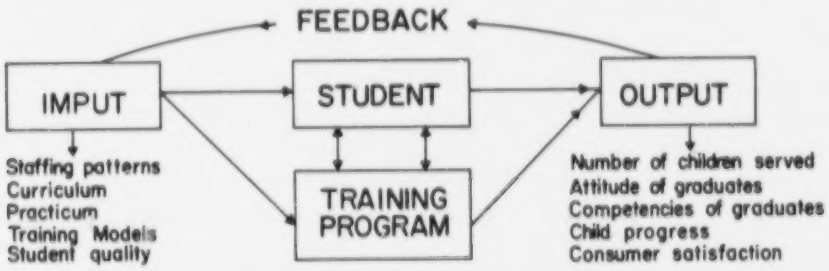
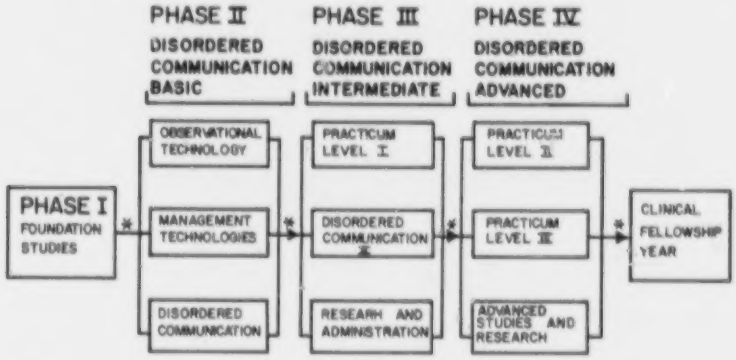


Figure 6. Evaluation model used in USU Department of Communicative Disorders.

During 1970-71 a field analysis of the audiology curriculum was made. Operational objectives within courses and practicum experiences were formulated, rating scales developed, and respondents selected from school districts, state offices, and universities. Data from respondents revealed comprehensive support for the USU curriculum, provided feedback to the training program, and resulted in some curricular revisions (Crookston, 1971).

The Delphi technique is being used by California State University, Los Angeles, in a follow-up formative evaluation of services required by a school audiologist and corresponding competencies needed. With this curriculum development approach, experts throughout the country "debate" points of view and come to general consensus through periodic response to a questionnaire (Jeffers, 1972).

A precision teaching or behavioral engineering approach to management, which is being incorporated into the USU curriculum in audiology on an increasing basis, provides particular opportunity for summative evaluation of effectiveness of approach and/or of child progress. Feeding this data into a national data bank for storage and retrieval has been considered (Johnson and Taylor, 1971). A design for moving from course-based to phase-oriented curriculum has also been presented, as noted in Figure 7 (Johnson, 1972).



*COMPETENCY-BASED EXAMINATIONS TO PROCEED FROM PHASE TO PHASE.

Figure 7. Phase structure program in Communicative Disorders.

The phase structure design has been endorsed by the Departmental staff for incorporation into the curriculum. It encompasses four phases, four exit examinations, and a format of curricular components from foundation studies to the clinical fellowship year required by the American Speech and Hearing Association. A student would be required to pass a competency-based examination to proceed from one phase to the next, notwithstanding grades earned in coursework.

The development and evaluation of individualized learning programs has also been initiated within the audiology curriculum at USU. The conversion of an entire professional education curriculum to an individualized performance-based teacher training program by Weber State University demonstrates the feasability and advantage of such an innovation (Parkinson, 1971). A Learning Resources Center and Instructional Improvement Division of the USU Library now provides opportunity for departmental faculty on this campus to convert group-paced instruction to individualized training. For example, the first in a planned series of learning programs on hearing and speech management has been developed by Berg (1972b). Entitled "Sensory Aids in Speech Remediation for the Hearing Impaired," it includes a booklet, a cassette with cartridge and earpiece, and accompanying test questions to assess verbal and performance competencies. The use of such an instructional technology component is a particularly valuable resource for transfer students and for specialists in the field who seek inservice training through independent study.

The USU audiology program provides flexibility for individual staff members to develop and evaluate particular areas of curriculum assigned to them. In a sequence of four courses leading to competencies in communication, environment, and education, Berg is identifying a pool of competencies, designing instructional experiences for the attainment of them, and evaluating and recording data on student achievement. Figure 8 presents a sample week of criteria-based instruction within one course of this sequence.

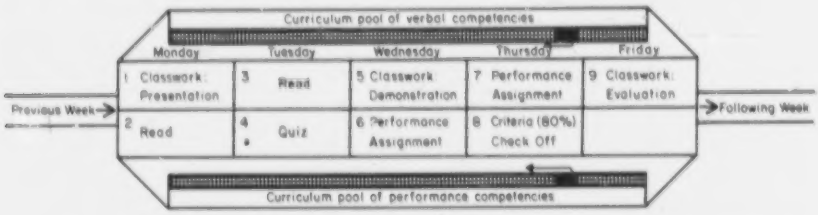


Figure 8. Sample week of criteria-based instruction for the three credit course "Education of the Hearing Impaired" within the audiology curriculum at Utah State University.

The instructional design of Figure 8 identifies the curricular pools of verbal and performance competencies from which the content is selected, presentation and demonstration together with outside assignments, and criteria for passing weekly examinations. General, verbal, and performance objectives for that given week are described below:

1. *General* objective—differentiate among normal hearing, hard of hearing, and deaf children.

2. *Verbal* competency—isolate the parameters that contribute to the differentiation among normal hearing, hard of hearing, and deaf children with particular focus on the speech signal, the auditory area, auditory recognition, speech performance, and language performance.

3. *Performance* competency—conduct, table data, and interpret results of mini-speech, mini-"listening," and mini-language tests with three children: one with normal hearing, one with moderate or severe loss, and one with profound or total impairment.

Another feature of this plan is to supervise and monitor the acquisition of areas of competencies within the audiology curriculum throughout the entire program of professional preparation. For example, a student will contact the topic of hearing aids and amplification systems in the following courses and practicums: hearing and speech management, advanced hearing and speech management, education of the hearing impaired, hearing aids, communication training, academic training, student teaching, and summer clinic. A record of the level of acquisition of competencies for each student will be kept and updated systematically. This record will provide data for recommending that student for employment.

An inservice evaluative model developed jointly by the Iowa Department of Public Instruction and Monterey Learning Systems also has particular reference to the audiology curriculum of USU (Caster, Dublinske, Grimes, 1971). Termed "humanistic behaviorism," it encompasses identification of individual child needs in behavioral terms, development of objectives based on needs, provision of service related to objectives, and evaluation of service in terms of behavioral change. Each objective must be specified as follows: *when* it is to be done, *who* is going to do it, *to whom* it is going to be done, *what* is going to be done, *criteria* that will indicate

accomplishment, and *evaluation method* used to determine if objective has been carried out. As audiology students emerge from the USU program, they may be expected to be competent in the implementation of the Iowa-Monterey model as well as other relevant accountability programs.

Many additional evaluative activities are being pursued by staff and advanced students of the Department of Communicative Disorders at USU. Of those pertaining to the audiology curriculum, the following might be mentioned: development of tests of communicative function, identification and clarification of the contribution of sensory aids, individualized communication training programs, early identification of hearing loss, home language facilitation, educational and environmental adjustments, clinical and educational supervision, hearing aid service, inservice and independent study programs, and accountability in state certification (Designing Education for the Future, 1970). An additional evaluation suggested by Sommers and Boone (1971), consultants to this project, is to study logs of the everyday activities of specialists on the "firing line."

Whereas a gap in American education has now been identified and even clarified, a critical need now exists to further study the roles and qualifications of specialists in the clinical and education management of the hard of hearing child, the parameters of program development, the criteria for program effectiveness, the types of children who need supportive services, the need for professional training programs, the need for special legislation and funding, and the means by which program implementation can occur through Federal agencies, state departments of education, and school districts (Healey, 1971). Among the states or localities engaged in such investigation are California (Spizzirri, 1971), Delaware (Rudy, 1971), Florida (Conlon, 1971), Illinois (Bothwell, 1972), Iowa (Dublinske, 1971), Maryland (O'Toole, 1971), Oregon (Conkey, 1971), St. Louis (Yater, 1971), Utah (Jensen, 1973), and Washington (Fudala, 1971).

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